Waste Area Group 5 Remedial Design/Remedial Action Work Plan, Phase I

1. INTRODUCTION

In accordance with the *Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991) between the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (IDEQ), hereafter referred to as the Agencies, DOE submits this Remedial Design/Remedial Action (RD/RA) Work Plan for the Auxiliary Reactor Area (ARA) and the Power Burst Facility (PBF). Under the current remediation management strategy outlined in the FFA/CO (DOE-ID 1991), the location identified for the remedial action is designated as Waste Area Group (WAG) 5, Operable Unit (OU) 5-12 at the Idaho National Engineering and Environmental Laboratory (INEEL). The remedial action for WAG 5 is divided into two phases. Phase I is specific to tanks and inactive waste systems located at ARA. Phase II is concerned with the remediation of contaminated soils located at both ARA and PBF. A separate work plan will be submitted for Phase II.

The OU 5-12 remedial action, as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 United States Code [USC] § 6901 et seq.) process, will proceed in accordance with the signed Record of Decision (ROD) for WAG 5, *Final Record of Decision for Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000a). The ROD presents the selected remedies for 55 individual sites evaluated under the WAG 5 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) (DOE-ID 1997a). Of these 55 sites, the ROD (DOE-ID 2000a) provides information to support remedial actions for six sites at ARA and one at PBF where contamination presents an unacceptable risk to human health and the environment. No additional remediation will be conducted under CERCLA for the remaining 48 of the 55 sites in WAG 5. However, institutional controls will be maintained at 15 of these 55 sites and will be addressed in the Phase II Work Plan. A "No Action" decision was made for the remaining 40 sites, as they were determined not to present an unacceptable risk.

The selected remedy for WAG 5 comprises three remedial actions to mitigate the risk associated with seven specific sites. The first remedial action addresses a collection of five individual sites (ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16) where contaminated soil is the only source medium. The second remedial action will mitigate residual contamination in a sanitary waste system (ARA-02). The only principal threat identified in WAG 5, addressed by the third remedial action, is posed by the contents of an underground storage tank (ARA-16). Of the three remedial actions, the two covering ARA-02 and ARA-16 are covered under this Phase I Work Plan. Remediation of the contaminated soil sites will be covered under the Phase II Work Plan. The seven sites requiring remedial action under the OU 5-12 ROD (DOE-ID 2000a) include the following:

- ARA-I Chemical Evaporation Pond (ARA-01)
- ARA-I Sanitary Waste System (ARA-02)
- ARA-III Radioactive Waste Leach Pond (ARA-12)
- ARA-I Radionuclide Tank (ARA-16)
- Radiologically Contaminated Surface Soils around ARA-I and ARA-II (ARA-23)

- ARA-I Soils beneath the ARA-626 Hot Cell (ARA-25)
- Special Power Excursion Reactor Test (SPERT)-II Leach Pond (PBF-16).

Management of stored and investigation-derived waste and groundwater monitoring are also components of the selected remedy. These will be covered under the Phase II Work Plan.

In addition to ARA-02 and ARA-16, four inactive waste systems will either be removed or abandoned in place through this Phase I Work Plan. These include the following:

- ARA-II, Seepage Pit to East (ARA-07)
- ARA-II, Seepage Pit to West (ARA-08)
- ARA-III, ARA-740 Sanitary Sewer Leach Field (ARA-13)
- ARA-IV, Septic Tank and Seepage Pit #2 (ARA-21).

For the ARA-25 site, there is the possibility that at least a portion, if not all, of the remedial action may occur as part of the Phase I activities. This is attributed to the fact that some of the stainless steel piping associated with the ARA-16 site intersects the soils and concrete foundation walls associated with the ARA-25 site. To expose the ARA-16 piping, it will be necessary to excavate some of the ARA-25 soils, as well as remove part of the foundation walls. Depending on the extent of these activities, it may be best to remove all of the soils and at least part, if not all, of the foundation walls. The final decision will be made once field activities commence and the actual extent of soil removal and foundation removal is determined.

1.1 Work Plan Organization

The RD/RA of WAG 5 is divided into two phases. Phase I is specific to ARA-02, ARA-16, and the four inactive waste systems located at ARA. As required by the EPA (EPA 1999), an institutional control status report will be submitted separately within six months of the approval of the ROD (DOE-ID 2000a) for the 15 sites requiring controls. Phase II covers the contaminated soil sites, management of the stored and investigation-derived waste, and groundwater monitoring aspects of the RD/RA. Phase II will also provide the operations and management and institutional control plan components of the remedial action.

This work plan outlines the major activities to be implemented in performing Phase I of the RD/RA of WAG 5 in accordance with the ROD (DOE-ID 2000a). The work plan describes the sites, contaminants, project management, tasks, schedules, and cost estimates. The following are brief descriptions of the work plan sections and appendices:

- Section 1 describes the background and history of WAG 5 and provides an overview of the selected remedies for the areas of concern.
- Section 2 provides the design criteria, including the design codes and standards, assumptions, and quality assurance.
- Section 3 discusses the remedial design of the project. A summary of the required activities is presented.

- Section 4 is the initial evaluation of the tanks and waste system components at WAG 5, including an evaluation of the potential risks to human health and the environment. Descriptions of existing site conditions, potential migration and exposure pathways, and an assessment of exposure routes are provided. Also, the remedial action objectives (RAOs) and applicable or relevant and appropriate requirements (ARARs) are identified.

- Section 5 outlines the OU 5-12 remedial action work plan. This section includes the necessary steps and documentation required for completing the remedial action of the tanks and closure of the inactive septic system sites as described in Sections 1 through 4. The required work tasks, project cost estimates, inspections, environmental and safety plans, and sampling and analysis plans are discussed in this section.

- Section 6 describes the necessary actions involved for each 5-year review to occur after the remedial action has taken place.

- Section 7 is a listing of the reference material.

- Appendix A, Design Drawings, contains drawings that detail the present conditions (e.g., topography and fencing) at each site, as well as the work to be performed during the remedial action.

- Appendix B, Technical Specifications, contains the technical specifications that provide the general terms and conditions required for completion of the remedial action.

- Appendices C through F contain engineering design files with technical information pertaining to the ARA-16 Radionuclide Tank remediation, including cleaning, structural analysis, and transportation.

- Appendix G, the Quality Designation and Record, assigns a quality level to the remedial action.

- Appendix H, Air Emissions Modeling Results, presents a summary of the results of the air emissions necessary to satisfy project ARARs.

- Appendix I, the Cultural Resource Summary, describes the cultural resource investigations, conclusions, and recommendations for WAG 5.

- Appendix J describes the management and disposal of wastes generated during Phase I activities.

- Appendix K provides the cost estimate, basis for the estimate, and related assumptions.

In addition, three separate documents are included with the RD/RAWork Plan:

- The Field Sampling Plan describes the sampling and analyses required during Phase I activities.

- The Quality Assurance Project Plan describes the necessary steps required to ensure the quality of project data.

- The Health and Safety Plan describes the possible hazards and the required steps to protect the health and safety of the workers.

1.2 Background

Located 51 km (32 mi) west of Idaho Falls, Idaho, the INEEL is a government-owned/contractor-operated facility managed by the DOE-ID (Figure 1-1). Occupying 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain, the INEEL encompasses portions of five Idaho counties: (1) Butte, (2) Jefferson, (3) Bonneville, (4) Clark, and (5) Bingham.

Comprising the ARA and PBF, WAG 5 is in the south-central portion of the INEEL. The ARA consists of four separate operational areas designated as ARA-I, ARA-II, ARA-III, and ARA-IV. Once known as the SPERT facilities, PBF consists of five separate operational areas: the PBF Control Area, the PBF Reactor Area (SPERT-I), the Waste Engineering Development Facility (SPERT-II), the Waste Experimental Reduction Facility (WERF) (SPERT-III), and the Mixed Waste Storage Facility (SPERT-IV). Collectively, the WERF, Waste Engineering Development Facility, and the Mixed Waste Storage Facility are known as the Waste Reduction Operations Complex.

1.2.1 ARA-02 Sanitary Waste System

The ARA-02 site is a sanitary septic system comprising three tanks in series: a seepage pit, three manholes, and the associated piping. The system was built in 1960 and serviced permanent and temporary ARA-I buildings until 1988 when ARA-I was inactivated. The ARA-02 septic system was designed and intended exclusively for sanitary waste. No known process waste was routed to the system, and no recorded spills or documented incidents were associated with the septic system. However, periodic surveys indicated radiological contamination. The source of the contamination is unknown.

As part of a Track 2 investigation (Pickett et al. 1993), soil samples were collected along the main line and outside of the seepage pit and septic tanks. The contents of the tanks, pit, and main line were also sampled. None of the soil samples yielded concentrations of Resource Conservation and Recovery Act (RCRA)-hazardous constituents. Low levels of beryllium, U-234, U-238, and Sr-90 were detected during the sampling of the pipeline between the septic tanks and the seepage pit. On the basis of the Track 2 risk evaluation, removal of the septic tank contents, confirmation sampling, and a reevaluation of the site in the WAG 5 Comprehensive RI/FS (DOE-ID 1997a) were recommended. In September 1996, a time-critical removal action was initiated to remove the contents of the three septic tanks.

During the WAG 5 Comprehensive RI/FS, boreholes were drilled, and samples were obtained from soil adjacent to the first two septic tanks and at the basalt interface. Samples were only collected from shallow soil alongside the third tank because the tank was blasted into basalt. Concentrations of arsenic, lead, Ra-226, Sr-90, U-234, and U-235 were detected in excess of human health contaminant screening levels. In addition, samples were collected from both the interior of the seepage pit and from soils outside of the pit. Contaminants detected in the sludge at concentrations in excess of human health screening levels include Ag-108m, Am-241, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Np-237, Pu-238, Pu-239/240, Ra-226, Sr-90, Tc-99, Th-230, U-234, U-235, U-238, arsenic, cadmium, chromium, copper, lead, nickel, silver, Aroclor-1242, and diethylether. The contaminants detected in the soil surrounding the seepage pit include Am-241, Cs-137, Eu-152, Ra-226, U-234, U-235, U-238, arsenic, chromium, copper, lead, and nickel. Ecologically based screening levels were exceeded for barium, chromium, and copper in the soil outside of the seepage pit.

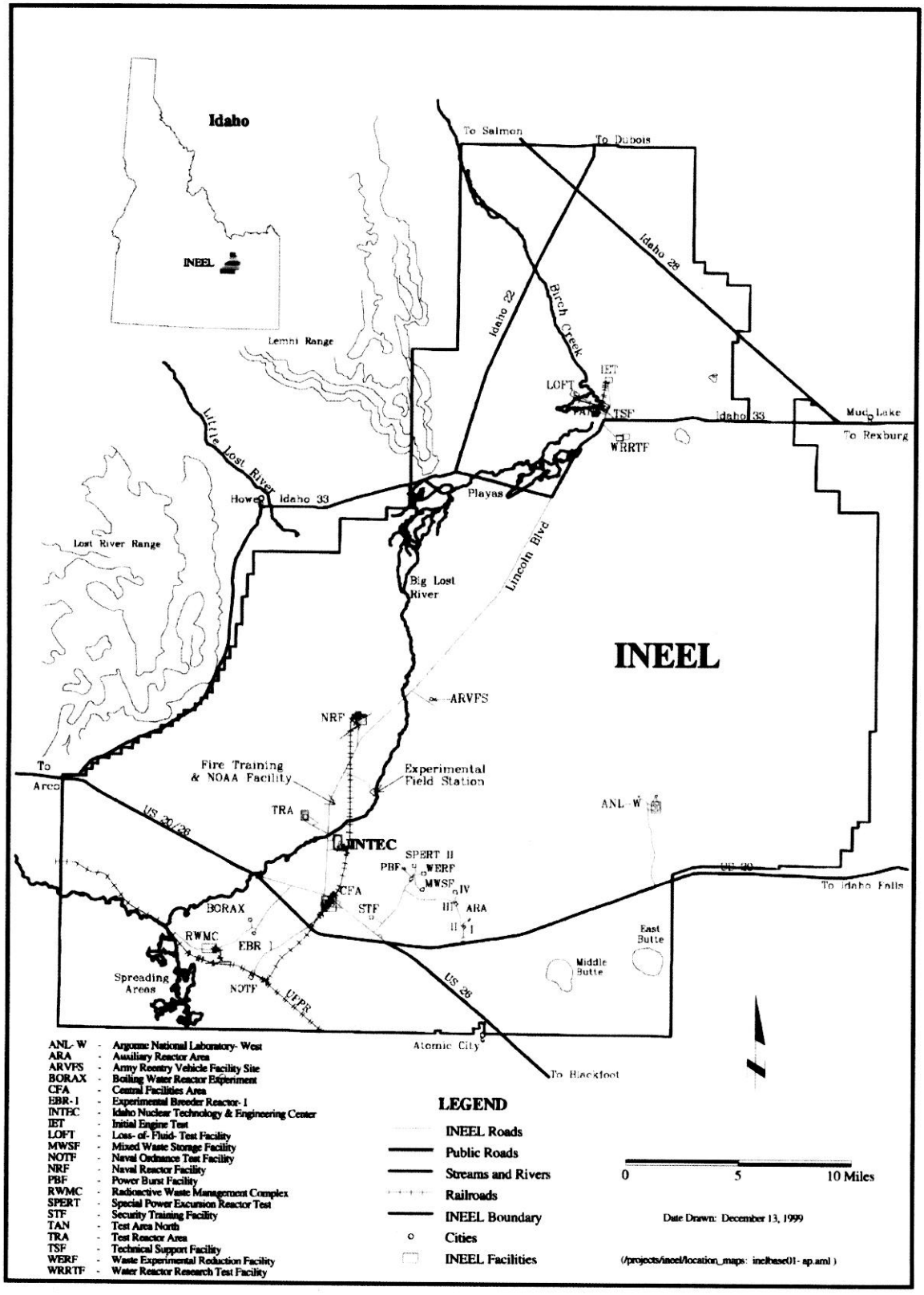

Figure 1-1. Idaho National Engineering and Environmental Laboratory.

Based on the results of the human health risk assessment, no contaminants of concern (COCs) were identified for the septic tank soils. The risk to human health at ARA-02 is attributed to the sludge remaining in the seepage pit. Using human health risk estimates, the COCs identified for the seepage pit sludge include Cs-137, Ra-226, U-235, U-238, Aroclor-1242, and lead. No COCs were identified for the septic tank soils based on the results of the ecological risk assessment. In addition, the seepage pit sludge is not available to ecological receptors. Because of the historical activities conducted at the ARA-I facilities that resulted in contamination of the ARA-02 system, all wastes and materials coming into contact with those wastes will be designated as F-listed.

1.2.2 ARA-16 Radionuclide Tank

The ARA-16 site is a 3,785-L (1,000-gal) stainless steel, underground holding tank resting within a lidless concrete vault and covered by approximately 1.1 m (3.5 ft) of soil. From 1959 to 1988, the tank received radioactive liquid waste (including wash water from the ARA-I hot cells) methanol, acetone, chlorinated paraffin, and mixed acids from materials testing, research and metal-etching processes. Periodically, the contents of the tank were emptied into a tank truck and transported to the Idaho Nuclear Technology and Engineering Center (known as the Idaho Chemical Processing Plant at that time) for disposal. The ARA-I facility was formally shut down in 1988, and the tank was partially excavated. All lines into and out of the tank were cut and capped, and the contents were agitated and pumped out, leaving a small amount of residual liquid and sludge in the tank. Soil from the excavation was replaced over the tank.

Data from three investigations of the ARA-16 Radionuclide Tank contents were considered in the WAG 5 Comprehensive RI/FS (Holdren et al. 1999). These investigations included the following:

- The Track 1 assessment including data from the 1988 shutdown activities (Holdren 1988)
- Sampling conducted in 1994 and reported in the WAG 5 Work Plan (DOE-ID 1997a, Appendix D)
- Additional characterization under the WAG 5 Work Plan reported in the RI/FS (Holdren et al. 1999).

Based on the 1997 data, the contents of the tank are classified as RCRA F-listed mixed waste and Toxic Substances Control Act (TSCA) regulated for polychlorinated biphenyls (PCBs), but not as transuranic waste. In addition to the tank sampling, samples were collected from boreholes drilled between the concrete vault and the tank, as well as outside the vault. Most of the contaminants detected in the tank waste were not detected outside of the tank, indicating that the tank has not leaked. Some contamination may have been caused by small spills as the tank was periodically emptied. The primary contributor to soil contamination in the area was the cleanup of the accident at Stationary Low-Power Reactor No. 1 (SL-1).

In accordance with the risk assessment protocol (LMITCO 1995), the contents of the tank were not quantitatively evaluated in the remedial investigation/baseline risk assessment because a release to the environment had not occurred. Therefore, the risk assessment was limited to evaluating the soil outside of the tank with Cs-137 being identified as the only COC based on human health risks. The site was eliminated from evaluation in the ecological risk assessment.

1.2.3 Inactive Waste Systems

Four inactive waste systems are included for closure in the RD/RA as a best management practice. Three of the systems (ARA-07, ARA-08, and ARA-21) lie outside of the fences of the respective facilities

that fed wastes to the individual system components with ARA-13 residing near the northwest boundary of the ARA-III facility. These facilities have subsequently been removed by decontamination and dismantlement (D&D) whose responsibility ends at the fence line. The four waste systems include: ARA-II Seepage Pit to East (ARA-720A) (ARA-07), ARA-II Seepage Pit to West (ARA-720B) (ARA-08), ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740)(ARA-13), and ARA-IV Test Area Septic Tank and Leach Pit No. 2 (ARA-21). Brief descriptions of these systems are provided in Section 3.2.3. Detailed information about the individual sites can be found in the WAG 5 Comprehensive RI/FS report (Holdren et al. 1999).

1.2.4 ARA-25 Contaminated Soils and Foundation

As part of the ongoing D&D activities at ARA-I, radiologically contaminated concrete floor slabs were cut out of the ARA-626 Hot Cells and disposed of at the Radioactive Waste Management Complex (RWMC). Because the concrete was poured directly on the soil, the undersides of the slabs (about 15 cm [6 in.] thick) were covered completely with soil. The soil that sloughed off the underside of the concrete slabs and the rebar protruding from the concrete were surveyed for radioactivity. Initial contamination levels of 50,000 disintegrations per minute were identified.

In 1998, the hot cells were removed and the concrete floor slab and underlying soil were sampled. Three soil samples were collected in the area of the floor drains, and three additional samples were taken of the concrete. The fixed contamination on the concrete was not evaluated for risk, but will be removed as part of the WAG 5 remediation. After sampling, a fixative was applied to the soil exposed under the concrete slabs, and the roof of the hot cell building was placed on the ground over the area for shielding. Results from the analysis of the soil samples demonstrate that the contaminated soil at ARA-25 is not classified as RCRA-hazardous waste. Through review of process knowledge and analytical data, DOE, EPA, and IDEQ have determined that the ARA-25 soil is not classified as hazardous waste (Rose 1999).

Based upon results of the quantitative risk assessment in the WAG 5 comprehensive baseline risk assessment (Holdren et al. 1999), arsenic, lead, Cs-137, and Ra-226 were identified as COCs based on human health risk estimates. In addition, copper and lead were identified as posing an unacceptable risk based upon the ecological risk assessment.

1.3 Selected Remedy

Based on consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, the Agencies have selected the following remedies for the tank sites at OU 5-12. Performance standards were implemented as design criteria for each site to ensure that the selected remedy protects human health and the environment. Five-year reviews will be used to ensure that the selected remedies remain protective and appropriate. Table 1-1 provides a summary of the selected remedies for the two tank sites and the four inactive waste systems covered by this Phase I Work Plan. Refer to Section 5 and Figure 5-1 for an overview of the Phase I project flow.

Table 1-1. Summary of the selected remedies.

Sites	Selected Remedy
ARA-02 Sanitary Waste System	Removal and off-Site disposal.
ARA-16 Radionuclide Tank (Three Options)	Option 1 Remove the ARA-16 Radionuclide Tank and contents intact. Remove the sectioned associated piping. Ship for off-Site ex situ thermal treatment and disposal. Excavate the concrete vault and dispose at an approved facility based on sampling results. Option 2 Remove the ARA-16 Radionuclide Tank contents for shipment to an off-Site facility for thermal treatment and disposal. Decontaminate and excavate the tank and associated piping and dispose at the RWMC. Excavate the concrete vault and dispose at an approved facility based on sampling results. Option 3 Place ARA-16 tank and contents in a low-risk state by performing the following activities: • Remove tank contents • Separate the liquid from the sludge. Filter the liquid to remove contaminants, as appropriate, and place the liquid into an approved container(s). Dewater the sludge to the extent practicable. • Meet the disposal facility acceptance requirements for liquid or stabilized liquid. For stabilization, the liquid will be solidified using grout or another approved solidification agent (such as Radsorb). Ship the waste to the INEEL CERCLA Disposal Facility (ICDF) or another approved on- or off-site disposal facility. • Store dewatered sludge phase in a TSCA/RCRA-approved storage area until an approved Treatment, Storage, and Disposal Facility (TSDF) is available to accept the waste. • Encapsulate tank, ancillary piping, and equipment for shipment to the ICDF or another approved on- or off-site disposal facility.

Table 1-1. (continued).

Sites	Selected Remedy
ARA-07 Seepage Pit to East	Remove and dispose wooden cover and above-ground blocks at an approved on-Site facility. Remove and recycle chain-link fencing. Backfill pit with earthen materials.
ARA-08 Seepage Pit to West	Remove and dispose of concrete slabs at an approved on-Site facility. Backfill pit with earthen materials.
ARA-13 Sanitary Sewer Leach Field and Septic Tank	Sample tank, manhole, and distribution box contents. Based on sampling results, either: (a) Remove and dispose of manhole, septic tank, distribution box, and contents at an approved off-Site facility or (b) Remove and dispose of contents at appropriate disposal facilities. Abandon all physical components in place. Note: Work Plan drawings show removal of components.
ARA-21 Test Area IV Septic Tank and Leach Pit No. 2	Sample tank and chlorine contact tank contents. Based on sampling results, either: (a) Remove and dispose of tank, chlorine contact tank, and contents at an approved off-Site facility, and abandon the seepage pit in place or (b) Abandon all components in place. Note: Work Plan drawings show removal of tanks and abandonment of seepage pit in place.
ARA-25 Soils beneath the ARA-626 Hot Cells	Remove and dispose of roof structure at an approved on-Site facility. Remove and dispose of concrete and soils at an approved off-Site facility.

2. DESIGN BASIS

2.1 General Description of the Project Components

The project components (support facilities, electrical power, and Title III services) are described in the following subsections.

2.1.1 Support Facilities

The support facilities to be used during field operations include a field office trailer, parking area, and laydown areas. The field office trailer is located at ARA-I. Parking for personnel vehicles is also available at ARA-I. Laydown areas are available at each of the task sites.

2.1.2 Electrical Power

Electrical power is available at the ARA-I and ARA-II sites for field operations use. Power at ARA-III and ARA-IV will need to be provided (as necessary).

2.1.3 Title III Services

Title III services will be provided by Bechtel BWXT Idaho, LLC (BBWI) on an as-needed basis. In addition, engineering support will be provided during prefield operations activities, field operations activities, and at field operations closeout. During field operations activities, appropriate BBWI personnel will review and evaluate field changes.

2.2 Design Criteria

2.2.1 BBWI Management Control Procedures

Title I, II, and III will be performed in compliance with pertinent BBWI management control procedures (MCPs). Current MCPs can be found on the INEEL intranet. Pertinent MCPs for this project are those identifying requirements in the following areas:

- Engineering Design
- Emergency Preparedness and Management
- Fire Protection
- Management Systems
- Occupational Safety and Health
- Radiological Protection
- Security
- Environmental Restoration
- Waste Management

- Conduct of Maintenance
- Quality.

The objective of this remedial action is to inhibit the potential exposure for human and environmental receptors and to minimize the spread of contamination. The following sections describe the activities at the individual sites covered under Phase I activities.

2.2.2 ARA-02 Sanitary Waste System

The selected remedy for the ARA-02 Sanitary Waste System is removal, ex situ thermal treatment, and disposal. This remedy was selected based on the comparative analysis of alternatives. Removal, ex situ thermal treatment, and disposal is the least costly alternative that meets threshold criteria (i.e., provides overall protection of human health and the environment and satisfies ARARs), is easily implemented because the treatment technology exists at the INEEL, and is currently operational. Long-term effectiveness is high because contamination will be permanently removed from the site and treated to reduce toxicity, mobility, and volume. The estimated time required to complete remediation is provided in Section 5.6. The activities to implement this alternative include the following:

- Excavation and removal of the sludge and all components of the septic system
- Shipment of the structural components of the system to an approved disposal facility (for cost estimation purposes, Envirocare was selected as the representative facility)
- Shipment of the sludge for treatment at WERF and then shipment of treated residuals to Envirocare
- Additional field screening and possible sampling of the soil to be excavated, and sampling of the septic tanks, piping, and pumice blocks
- Dust control and environmental monitoring to be conducted during active remediation.

The only waste in the system is the sludge in the bottom of the seepage pit; waste was previously removed from the septic tanks. The dry sludge remaining in the seepage pit contains low concentrations of radionuclides, heavy metals, and organics, including Aroclor-1242. Analysis indicates this sludge is not RCRA characteristic or TSCA regulated. However, the seepage pit sludge, pumice blocks, septic tanks, and associated piping are designated RCRA F-listed (i.e., F001) for 1,1,1-trichloroethane and trichloroethylene on the basis of sludge analysis from the septic tanks and process knowledge. Remediation goals for the ARA-02 Sanitary Waste System are listed in Table 4-1.

Excavation and removal of the seepage pit and the associated septic system will require use of conventional excavation equipment (such as backhoes and front-end loaders) and hand digging. Soil will first be removed from around the seepage pit and septic system tanks and pipes. Because soil sampling results indicate that the concentrations of all contaminants are well below the remediation goals, remediation of ARA-02 soil is not anticipated, and the soil will be returned to the excavation following verification sampling.

After soil is removed from around the seepage pit, the pumice blocks will be removed, sampled and analyzed, then packaged for shipment to a RCRA-permitted, off-Site disposal facility such as Envirocare. The pumice blocks, which comprise the walls of the seepage pit, have not been sampled. Since the seepage pit was designed to allow waste to leach into the ground, the blocks are assumed to be contaminated with the same compounds detected in the sludge and at similar concentrations. Therefore,

the blocks would meet RCRA land disposal criteria without treatment. However, if sampling indicates the blocks are contaminated at significantly higher levels than detected in the sludge, the disposal facility may be required to encapsulate the pumice blocks to satisfy waste acceptance criteria for disposal. Because of the porous nature of the pumice blocks, decontamination to meet the RCRA clean debris standard is not feasible.

The septic tanks and associated piping will also be removed, sampled, analyzed, and packaged for shipment to a RCRA-permitted mixed waste disposal facility off the INEEL, such as Envirocare. If the waste acceptance criteria for the INEEL facility allow disposal of RCRA-listed waste, the tanks and piping can be disposed of at the INEEL. Though the septic tanks and piping were not previously sampled, contamination levels are anticipated to be low. Septic tanks and the associated piping are typically constructed to be impervious and water tight; hence, contamination should be limited to the surfaces that came in contact with the waste. Furthermore, after the contents were removed from the septic tanks during the previous removal action, the sides and bottom of the tanks were thoroughly scraped to remove all visible traces of waste (Dietz 1998). Therefore, it is anticipated that the tanks and pipes will meet RCRA land disposal criteria without further treatment. However, encapsulation at Envirocare will be performed, if required, to meet the waste disposal criteria.

The ARA-02 seepage pit sludge will be removed and packaged for shipment and incineration at WERF. Because the sludge is dry, no absorbents would be necessary. The treatment residuals will be transported for disposal at a permitted disposal facility off the INEEL, such as Envirocare. If required, the treated residuals will be stabilized at WERF before shipment to meet the waste acceptance criteria for the disposal facility.

Current radiological and industrial hygiene control practices will be used to reduce radiation and exposure to toxic materials for the workers. Radiological controls could consist of limiting the amount of time a worker can work in the area, requiring personnel to wear personal protective clothing, and using distance and shielding to reduce radiation exposure. Industrial hygiene controls could include use of personal protective clothing to prevent dermal exposure to contaminants and respirators to prevent inhalation of toxic substances. Air emissions will be controlled by the use of water sprays or soil fixatives to suppress dust during soil excavation and removal.

During excavation, soils will be field screened to verify the absence of contamination. If evidence of contamination is encountered, soil samples will be collected for laboratory analysis to determine if the contamination poses an unacceptable risk. If the contaminated soil volume is minimal and only radiologically contaminated, it will be shipped to the RWMC for disposal. Following removal of the ARA-02 Sanitary Waste System, the excavated site will be backfilled with uncontaminated soil, compacted, and vegetated in accordance with INEEL guidelines (DOE-ID 1989).

2.2.3 ARA-16 Radionuclide Tank

The selected remedy in the WAG 5 ROD for the ARA-16 site was removal of the Radionuclide Tank waste and shipment for ex situ thermal treatment and disposal. However, the early opening of the INEEL CERCLA Disposal Facility (ICDF) for accepting waste for storage has made this a new option for the liquid that meets threshold criteria (i.e., provides overall protection of human health and the environment and satisfies ARARs) and is easily implemented. The work structure will be to:

- Remove the tank contents, separating the liquid and sludge phases.
- Filter the liquid phase, as appropriate, to meet the disposal facility's acceptance criteria for liquid or stabilized liquid. For stabilization, the liquid will be solidified using grout or another approved

solidification agent (such as Radsorb). Ship the waste to the ICDF or another approved on- or off-site facility for disposal.

- Store the dewatered sludge in a TSCA/RCRA-approved storage area until an approved TSDF is available to accept the waste.

- Encapsulate tank, ancillary piping, and equipment for shipment to the ICDF or another approved on- or off-site facility for disposal.

The long-term effectiveness is high for this alternative because contamination will be permanently removed from the site and treated to reduce toxicity, mobility, and volume. The estimated time required to complete remediation is provided in Section 5.6. Specifically, the alternative will consist of the following activities:

- Remove tank contents separating the liquid and sludge phases. Filter the liquid phase, as appropriate, to meet the disposal facility's acceptance criteria. For the stabilization, the liquid will be solidified using grout or another approved solidification agent (such as Radsorb). Transport the waste to the ICDF or another approved on- or off-site facility for disposal. Store the dewatered sludge in a TSCA/RCRA-approved storage area until an approved TSDF is available to accept the waste.

- Decontaminate the tank and associated piping to the extent practicable

- Excavate the tank and vault

- Perform dust control and environmental monitoring during active remediation

- Dispose of the tank and associated piping at the RWMC or another approved facility on the INEEL

- Perform additional sampling of the vault

- Dispose of other secondary waste generated during remediation at an approved facility such as Envirocare or on the INEEL

- Final restoration of the site will be completed in conjunction with remediation of the ARA-23 soils.

The ARA-16 tank contains approximately 17 L (4.5 gal) of sludge and 1,180 L (312 gal) of liquid waste (Coveleskie 1999). The waste contains high concentrations of radionuclides, toxic metals, and organics, including PCBs. Based on sampling results and process knowledge, the waste is considered low-level radioactive mixed waste and is identified as RCRA-listed waste code F001 because of concentrations of trichloroethylene, methylene chloride, and 1,1,1-trichloroethane, and waste code F005 for toluene. Additionally, the waste is classified as RCRA-characteristic waste for trichloroethylene. Aroclor-1260 was detected at 98 part per million (ppm) in the sludge; hence, the waste is also regulated under the TSCA.

The tank contents will be removed and separated. The liquid phase will be filtered, as appropriate, to remove the contaminants to meet the disposal facility's acceptance criteria. If the liquid needs to be stabilized, it will be solidified using grout or another approved solidification agent (such as Radsorb). The waste will be transported to the ICDF or other on- or off-site facility for disposal. The dewatered sludge will be stored in a TSCA/RCRA-approved storage area until an approved TSDF is available to accept the

waste. The Allied Technology Group, Inc. (ATG) located in Richland, Washington, is a mixed waste treatment facility off the INEEL under consideration for treatment of the ARA-16 tank waste sludge. The ATG facility is in the process of obtaining the necessary RCRA and TSCA permits. The ATG facility will use high-temperature thermal processes to destroy organics, including PCBs, to meet the RCRA land disposal regulations for organics and the TSCA PCB disposal criteria. The final waste form from the ATG system is a nonleachable glass that will also satisfy RCRA criteria for heavy metals and will immobilize radionuclides.

Excavation and removal of the structural components of the tank system will require use of conventional excavation equipment (such as backhoes and front-end loaders) and hand digging. During excavation, soils will be field screened to verify the absence of contamination. If evidence of contamination is encountered, soil samples will be collected for laboratory analysis to determine if the contamination poses an unacceptable risk. Following verification sampling, uncontaminated soil will be returned to the excavation site. If the contaminated soil volume is minimal and only radiologically contaminated, it will be shipped to the RWMC for disposal.

The ARA-16 tank and associated piping will be decontaminated to the extent possible according to TSCA and RCRA decontaminating standards and procedures. Sampling will be performed to determine if the RCRA clean debris standard is met. Since the tank and pipes are stainless steel, it is assumed that these materials can be cleaned to meet criteria for disposal as non-RCRA regulated, low-level radioactive debris at the RWMC or another disposal facility on the INEEL. Encapsulation of the tank and pipes will be performed only if required to meet the waste acceptance criteria of the disposal facility. The decontamination residue will be combined with the tank waste in a high-integrity container for treatment and disposal at an approved facility.

Previous sampling results indicate the ARA-16 tank has not leaked (Holdren et al. 1999). Therefore, the remedy incorporates the assumption that the vault and the gravel within the vault can be disposed of at the INEEL as low-level waste. The most likely location for disposal of the vault and gravel is the RWMC.

Current radiological and industrial hygiene control practices will be used to reduce worker exposure to radioactive and toxic materials. Radiological controls could consist of limiting the amount of time an operator can work in the area, requiring personnel to wear personal protective clothing, and using distance and shielding to reduce radiation exposure. Industrial hygiene controls could include use of personal protective clothing to prevent dermal exposure to contaminants and respirators to prevent inhalation of toxic substances. Air emissions will be controlled by the use of water sprays or soil fixatives to suppress dust during soil excavation and removal.

Following removal of the ARA-16 tank system, the excavated site will be backfilled with uncontaminated soil, compacted, and vegetated in accordance with INEEL guidelines (DOE-ID 1989).

2.2.3.1 Alternative Approach. The following alternative approach to the chosen remedial action is being considered:

- Remove the radionuclide tank with the waste intact
- Cut and crimp or foam and cut the associated piping with the waste intact
- Ship the tank and piping to an off-Site facility for treatment and disposal.

Discussions are ongoing with off-Site disposal facilities to determine the feasibility of removing the tank with the contents intact along with cutting and crimping (foaming and cutting) the associated piping, also with the contents intact. If the off-Site facility has the capability of treating the waste in this form and the project can perform the removal without undue risk to workers or the environment, this may prove to be a viable option. The rest of the remedial action approach will be as described above with this alternative approach to the tank and piping removal considered as meeting the intent of the remedial action described in the ROD (DOE-ID 2000).

2.2.3.2 Selected Approach. Upon further review of the analytical data and discussions with the Agencies during the table top review held May 23, 2000, it was decided that removal of the radionuclide tank with the liquid/sludge contents intact posed too great a risk. This is attributed to the potential for chloride concentrations in the sludge adversely affecting the structural integrity of the tank walls and welds in contact with the sludge. Therefore, the waste in the tank will be removed onsite. The waste has a liquid phase and a sludge phase. The liquid phase will be separated and filtered, as appropriate, to remove contaminants to meet the disposal facility's acceptance criteria for liquid or stabilized liquid. If the liquid requires stabilization, it will be solidified using grout or another approved solidification agent (such as Radsorb). The waste will be transported to the ICDF or another on- or off-site facility for disposal. The sludge will be dewatered to the extent practicable and placed in a TSCA/RCRA-approved storage area until an approved TSDF is available to accept the waste.

2.2.4 Inactive Waste Systems

The following subsections summarize the actions to take place at each of the inactive waste system sites.

2.2.4.1 ARA-07: ARA-II Seepage Pit to East. Upon review of existing analytical data and anecdotal information, the decision was reached to abandon the ARA-07 seepage pit in place. Specifically, the following activities will take place:

- Remove the chain-link fencing and fence posts. Conduct radiological field screening of fencing materials and either recycle the materials or dispose of at an approved facility.
- Remove the wooden roof structure that is covered with rolled roofing. Conduct radiological field screening of the structural materials, verify that the roofing material does not contain asbestos, and dispose of at an approved facility.
- Backfill the seepage pit with earthen materials to within 0.9 m (3 ft) of the surrounding ground surface.
- Remove pumice blocks to a depth of approximately 0.6 m (2 ft) below ground surface. Conduct radiological field screening of pumice blocks and dispose of at an approved facility.
- Backfill the remainder of the seepage pit with earthen materials. Compact and smooth to grade. Revegetate as required.

2.2.4.2 ARA-08: ARA-II Seepage Pit to West. Upon review of existing analytical data and anecdotal information, the decision was reached to abandon the ARA-08 seepage pit in place. Specifically, the following activities will take place:

- Excavate and remove the concrete slabs over the seepage pit. Conduct radiological field screening on the slabs and dispose of at an approved facility.

- Backfill the seepage pit with earthen materials. Compact and smooth to grade. Revegetate as required.

2.2.4.3 ARA-13: ARA-III Sanitary Sewer Leach Field and Septic Tank. Upon review of existing analytical data and anecdotal information, the decision was reached to collect additional samples of the contents in the septic tank, manhole, and distribution box for laboratory analysis. Disposition of materials and components will be determined upon review of the analytical data. Specifically, the following activities will take place:

- Sample the septic tank, manhole, and distribution box contents. If the contents are dry and the analytical results demonstrate that the contents do not pose an unacceptable health or environmental risk and are not RCRA and/or TSCA regulated, the components will be abandoned in place by backfilling with earthen materials, smoothing to grade, and revegetating as required. If the contents are not dry and the analytical results demonstrate that the contents do not pose an unacceptable health or environmental risk and are not RCRA and/or TSCA regulated, the contents will be removed and the components abandoned in place as above. Otherwise, the following steps apply.

    - Remove materials from the septic tank, manhole, and distribution box for treatment and/or disposal at an approved facility.

    - Clean the septic tank, manhole, and distribution box as per applicable regulations.

    - Abandon all physical components in place.

    - Backfill the excavated area with earthen materials. Compact and smooth to grade. Revegetate as required.

2.2.4.4 ARA-21: ARA-IV Test Area Septic Tank and Leach Pit No. 2. Upon review of existing analytical data and anecdotal information, the decision was reached to determine the matrix of the contents in the tanks. If the contents are liquid, samples of the contents of the septic tank and the chlorine contact tank will be collected for laboratory analysis. Disposition of materials and components will be determined upon review of the analytical data. Specifically, the following activities will take place:

- Sample the septic tank and chlorine contact tank contents. If the contents are dry and the analytical results demonstrate that the contents do not pose an unacceptable health or environmental risk and are not RCRA and/or TSCA regulated, the components will be abandoned in place by backfilling with earthen materials, smoothing to grade, and revegetating as required. If the contents are not dry and the analytical results demonstrate that the contents do not pose an unacceptable health or environmental risk and are not RCRA and/or TSCA regulated, the contents will be removed and the components abandoned in place as above. Otherwise, the following steps will apply:

    - Remove materials from the septic tank and chlorine contact tank for treatment and/or disposal at an approved facility.

    - Clean the septic tank and chlorine contact tank, as required.

    - Excavate the septic tank, chlorine contact tank, and associated connection piping for treatment and/or disposal at an approved facility.

- Backfill the seepage pit and excavated area with earthen materials. Smooth to grade and revegetate as required.

2.2.5 ARA-25: ARA-I Soils Beneath the ARA-626 Hot Cells

ARA-25 may have to be remediated during Phase I of the WAG 5 RD/RA in order to remove the drains due to the area overlap between the ARA-25 soils and concrete foundation with the hot drainline to the ARA-16 Radionuclide Tank. Specifically, the following activities will take place:

- Remove the temporary roof covering the ARA-25 area. Conduct radiological field screening of the roof cover and dispose of at an approved facility.
- Excavate and isolate the soils within the ARA-25 hot cell foundations. Dispose at an approved facility.
- Excavate and remove the concrete foundations and hot cell drainlines. Dispose at an approved facility.
- Backfill the excavation with clean, earthen materials. Compact and smooth to grade. Revegetate as required.

2.3 DOE Related Codes, Standards, and Documents

The following DOE-related codes, standards, and documents will be used as the basis for the remediation of OU 5-12:

- DOE-ID 2000, *Final Record of Decision for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12*
- DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*
- DOE Order 435.1, Chapter IV, *Radioactive Waste Management*
- DOE Order 5400.5, *Radiation Protection of the Public and the Environment*
- DOE Order 414.1, *Quality Assurance*
- DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*
- DOE Order 231.1, *Environment, Safety, and Health Reporting*
- DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*
- DOE Order 470.1, *Safeguards and Security Program.*

2.4 Engineering Standards

Appendix B contains references to the latest engineering standards and the specifications to which they apply.

2.5 Environmental and Safety

The following is a list of potential chemical-specific and action-specific ARARs identified in the ROD. A detailed discussion of the ARARs is presented in Section 4.2.

Action-Specific ARARs:

- Idaho Administrative Procedures Act (IDAPA) 16.01.01.161, "Toxic Substances"
- IDAPA 16.01.01.585 and .586, "Toxic Air Emissions"
- IDAPA 16.01.01.650 and .651, "Fugitive Dust"
- IDAPA 16.01.01.500.02, "Requirements for Portable Equipment"
- 40 *Code of Federal Regulations* (CFR) 61.92, "Radionuclide Emissions from DOE Facilities"
- 40 CFR 61.93, "Emission Monitoring"
- 40 CFR 61.94(a), "Emission Compliance"
- IDAPA 16.01.05.006 (40 CFR 262.11), "Hazardous Waste Determination"
- IDAPA 16.01.05.008 (40 CFR 264.13[a][1–3]), "General Waste Analysis"
- IDAPA 16.01.05.008 (40 CFR 264.15), "General Inspections"
- IDAPA 16.01.05.008 (40 CFR 264, Subpart C), "Preparedness and Prevention"
- IDAPA 16.01.05.008 (40 CFR 264, Subpart D), "Contingency Plan and Emergency Procedures"
- IDAPA 16.01.05.008 (40 CFR 264.114), "Equipment Decontamination"
- IDAPA 16.01.05.008 (40 CFR 264.171–177), "Use and Management of Containers"
- IDAPA 16.01.05.008 (40 CFR 264.197 [a]), "Tank Closure and Post Closure Care"
- IDAPA 16.01.05.011 (40 CFR 268.40 [a][b][e]), "Treatment Standards"
- IDAPA 16.01.05.011 (40 CFR 268.45 [a–d]), "Treatment Standards for Hazardous Debris"
- IDAPA 16.01.05.011 (40 CFR 268.48 [a]), "Universal Treatment Standards"
- IDAPA 16.01.05.011 (40 CFR 268.49), "Alternative Treatment Standards for Contaminated Soil"
- 40 CFR 300.440, "Procedures for Planning and Implementing Off-Site Response Actions"
- 40 CFR 761.61 (b)(1), "PCB Remediation Waste: Performance-Based Disposal"

- 40 CFR 761.79 (c)(1) and (2), "Decontamination Standards and Procedures: Self-Implementing Decontamination Procedures"
- 40 CFR 761.79 (d), "Decontamination Solvents"
- 40 CFR 761.79 (e), "Limitation of Exposure and Control of Releases"
- 40 CFR 761.79 (g), "Decontamination Waste and Residues."

Location-Specific ARARs:

- 16 USC 470 h-2, "Historic Properties Owned or Controlled by Federal Agencies"
- 36 CFR 800.4, "Identification of Historic Properties"
- 36 CFR 800.5, "Assessing Effects"
- 25 USC 3002 (43 CFR 10.6), "Custody"
- 25 USC 3005 (43 CFR 10.10), "Repatriation."

2.6 Design Assumptions

The following sections describe the assumptions under which the RD/RA activities will be performed for each of the sites.

2.6.1 ARA-02 Sanitary Waste System

- Exact locations and/or the existence of sewer branch lines from Building 627, the former guard house (Building 628), and the two former office trailers are not known. Locations have been illustrated on the drawings in Appendix A based on available information.
- Concrete foundations are still intact where pipelines exit the former building locations.

2.6.2 ARA-07: ARA-II Seepage Pit to East

- Based on analytical results and anecdotal information, the seepage pit contains no hazardous materials that will interfere with abandonment activities
- The upper layers of pumice blocks are not held in place by metal reinforcements, which would prevent their easy removal.

2.6.3 ARA-08: ARA-II Seepage Pit to West

- Based on analytical results and anecdotal information, the seepage pit contains no hazardous materials that will interfere with abandonment activities.

2.6.4 ARA-13: ARA-III Sanitary Sewer Leach Field and Septic Tank

- The manhole, septic tank, and distribution box contain materials that will be sampled and analyzed for hazardous constituents. Abandonment, material removal, and disposition actions will be based upon the analytical results.

- Leach field lines will remain in place, except those which are necessary to remove during the extraction of the distribution box.

- No contaminated soils are associated with this site.

2.6.5 ARA-16 Radionuclide Tank

- The tank contains approximately 17 L (4.5 gal) of sludge and 1,180 L (312 gal) of liquid waste. The removal of the tank contents will reduce radiation levels to near background allowing for safe working conditions.

- No enclosure over the tank is required to contain volatile or otherwise mobile contaminants during remediation.

- The tank is structurally intact.

- The tank has not leaked; hence, the gravel and vault are not RCRA or TSCA regulated.

2.6.6 ARA-21: ARA-IV Test Area Septic Tank and Leach Pit No. 2

- The septic and chlorine contact tanks contain materials that will be sampled and analyzed for hazardous constituents. Abandonment, material removal, and disposition actions will be based upon the analytical results.

2.6.7 ARA-25: Soils Beneath the ARA-626 Hot Cells

- Contaminated soils are contained within the concrete foundations.

- All excavated soil will be sent to the RWMC for disposal.

2.7 Quality Assurance

A Quality Level Designation and Record, included as Appendix G, has been prepared for all the activities of the project. A Quality Level of 3 has been deemed appropriate for this project. All design, procurement, and field operations activities will be in accordance with the Quality Level 3 designation.

The *Implementing Project Management Plan for the Idaho National Engineering and Environmental Laboratory Remediation Program* (LMITCO 1998), hereinafter referred to as the project management plan, has been adopted for this project and is incorporated by reference. The guidance governs the functional activities, organization, and quality assurance/quality control (QA/QC) protocols that will be used for this project. The *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites* (DOE-ID 1997b) has also been adopted for this project. This plan governs the QA/QC requirements for data.

Where applicable, the project specifications (Appendix B) shall specify the QA/QC procedures for the given task, consistent with guidance provided by the project management plan and the Quality Level 3 designation.